VFD run RING FRAME MOTOR'S ENERGY LOSS in Textile Mill

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Abstract:- The existing Textile mill ring frame motor is running above 50 Hz and this resulted in **energy loss of 8000 Units or Rs.60,000/- per frame per year**. Later the mill reduced the VFD frequency from 60 to 50 Hz and re-sized / re-oriented that motor's pulley **at near Zero cost, for the same production**. This new zero cost energy saving practice compelled us to share with you, the healthy practice of running the ring frame main motor. This new practice will benefit other mills, who have been losing Lakhs of Electricity units all these years.

ENERGY SAVING: -

1. **CASE STUDY 1 :-** This mill long ring frame 50 Hz rated 55 KW motor consumed average 48 KWH per hour starting from Empty DOFF to full DOFF by 'Camel-back' pattern of loading, running COARSE Count, & operated at 60 Hz, Later they implemented this zero cost measure involving motor pulley re-sizing and VFD run frequency is set at 50 Hz. **The mill recorded the KWH savings by EMS as 2 % of motor running KW**.

2. **CASE STUDY 2 :-** This mill long ring frame 50 Hz rated 55 KW motor consumed average 28 KWH per hour starting from Empty DOFF to full DOFF going by 'Camel-back' pattern of loading. running FINE Count, & operated at 75Hz, Later they implemented this zero cost measure involving motor pulley re-orientation, and now VFD run frequency is set at 50 Hz & recorded KWH savings by EMS, as 2 % of motor running KW.

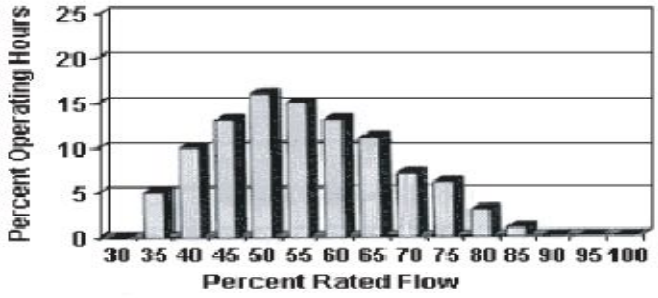


Figure 5.3 Example of an excellent variable speed drive candidate

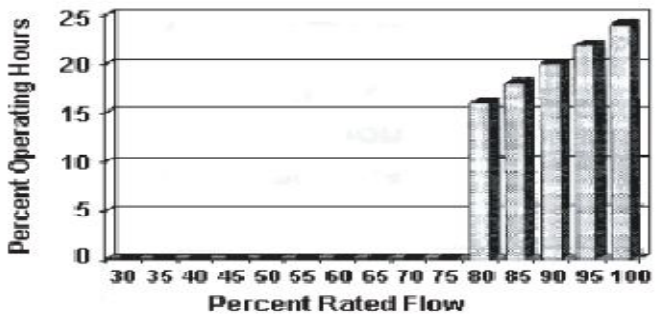


Figure 5.4 Example of a poor variable speed drive candidate

EXISTING RING FRAME MOTOR LOSSES:-

The reasons for the increase in energy Losses are :-

1. The motor may be Energy Efficient Motor but it is not Inverter duty motor to run on existing VFD.
2. The Core loss and Friction & Windage losses increases on higher speeds above 50 Hz.
3. It is running at starved and higher ambient harsh conditions of above 5*C.
4. The motor is running thro VFD but without Line Reactance Choke (which can reduce the harmonics)
5. But actually, the motor is de-rating from 55 KW rating faster now due to higher ambient surroundings.
6. And the motor runs hotter due to the VFD's non linear harsh input instead of linear input to motor.
7. The mill lubricates this motor's open-bearings with Lithium based conventional mineral oil greasing only.
8. The motor is covered with fluff densely in the visible and invisible areas of fins.
9. Today, open any of your Long frame motor hoods and you will find heavy of deposit of fluff on motor fins.

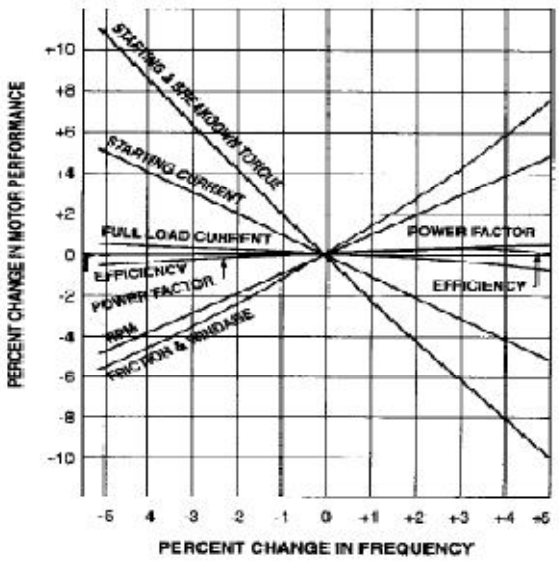
HOW TO IMPROVE MOTOR SAVINGS:-

1. First discuss with the OEM what now to be done to run motor at 50 Hz and below. Next is to re-orient / re-size the pulley. Bring down the motor frequency to and less than 50 Hz frequency. Now alter the ramp and pulley

settings in consultation with the OEM. **Now we can run the same frame at the same textile production output parameters and that we observe the motor KWH savings around 2 % here after.**

Table 2.2 Motor Loss Categories

Losses	2- Pole average	4- pole average	Factors affecting losses
Core losses	19%	21%	Electrical steel, air gap, saturation
Friction & Windage losses	25%	10%	Fan efficiency. Lubrication, bearing
Stator Copper losses	26%	34%	Conductor area, mean length of turn, heat dissipation
Rotor Copper losses	19%	21%	Bar and end ring area and material
Stray Load losses	11%	14%	Manufacturing process, slot design, air gap



2. To sustain this 2 % savings in this existing motor, let us comfort the motor to reduce Friction & Windage losses.
3. From bearings, remove existing MP3 type grease and switch over to Polyurea thickened Lithium complex based mineral oil greasing. This grease offers mechanical shear stability, stiffer grease consistency, rust inhibition and deposit control and delivers exceptional protection even under the most demanding conditions, such as high temperatures and high speeds. This suits to ring frame motor bearings which face tangential shear stress.
4. Provide Line Reactance Choke at the Inverter Incoming. This will act as Buffer between the Incoming & VFD by way of Harmonics Reduction to the Incoming. These will first house arrest the Harmonics within the VFD housing and Harmonic Distortion is reduced from the ring frame. Also to study later with VFD vendor, the need for Load Reactance Choke to attenuate the spikes from VFD to the motor, even if it nears the motor.
5. **To confirm the ring frame energy savings, install 3 phase 4 wire KWH meter in the ring frame panel.**
6. **BEE recommends metering any motor above 10 HP running for 2 shifts a day / 6000 hours a year.**
7. Machine cleaning externally is done routinely. Use the same cleaning compressed air and routinely clean the motor fins all around that are deposited with heavy fluff. CLEAN motor dissipates heat better & thus saves. If the motor is not allowed to dissipate heat thro fins, this will de-rate the motor and reduce its efficiency.
8. The VFD to the ring frame improves operational convenience. If the same VFD is used with healthy settings, Ramp & Controller set values, and operated within range of motor ratings, we can derive more benefits.
9. Always look for improvement in motor savings. So viewing all the ring frames' daily logged relative power consumption of all ring frames, we can infer which motor consumes more. Here, conduct a trial with the new motor replacing the 55 KW motor, **suitable higher sized KW Inverter duty motor. And study the energy savings achieved for two weeks before and after.**
10. **Always allow the 'Running In' for any new motor for say 100 hours first,** and then start conducting the trial. Whatever new motor trial is conducted, it must be done in Hot running motor identical loading conditions.
11. Normally any motor 50 Hz rated can be allowed as per the Motor OEM, to run at say 60 to 75 Hz or more. But **we must understand now that the motor will run inefficiently only, if it is not Inverter- Duty type motor**.

POINTER TO THE MILLS:-

The objective of providing VFD to motors is to achieve energy savings and improving the OPM, Operating Profit Margins. So the mills need to make use of the VFD potential to soft starter, improved motor safety and Energy Savings, and overall productivity improvements at the touch of button, to achieve instantly. **PLEASE Look TODAY, for savings in UPH / UKG by healthy running of motors and relative condition monitoring**.